IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

NANOCO TECHNOLOGIES LTD., Plaintiff, v. LG ELECTRONICS INC., and LG ELECTRONICS U.S.A., INC., Defendants.	CIVIL ACTION NO. 2:25-cv-00431 **JURY TRIAL DEMANDED**

NANOCO TECHNOLOGIES LTD'S COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Nanoco Technologies Ltd. ("Nanoco" or "Plaintiff") files this Complaint for Patent Infringement ("Complaint") against LG Electronics, Inc. ("LGE") and LG Electronics U.S.A., Inc. ("LGEUS") (collectively, "LG" or "Defendants"). Plaintiff alleges, based on its own personal knowledge with respect to its own actions and based upon information and belief with respect to all others' actions, as follows:

THE PARTIES

1. Plaintiff Nanoco Technologies Ltd. is a corporation organized and existing under the laws of the United Kingdom with a place of business at The Heath Business & Technical Park, Runcorn, Cheshire, WA7 4QX, United Kingdom.

2. Nanoco is the sole owner of, and possesses all rights, interests, and title of, U.S. Patent No. 7,588,828 ("the '828 patent") (attached as Exhibit 1), U.S. Patent No. 7,803,423 ("the '423 patent") (attached as Exhibit 2), U.S. Patent No. 7,867,557 ("the '557 patent") (attached

as Exhibit 3), and U.S. Patent No. 8,524,365 ("the '365 patent") (attached as Exhibit 4) (Collectively, the "Patents-in-Suit" or "Asserted Patents").

3. Defendant LGE is a Korean corporation with a principal place of business at LG Twin Towers, 128 Yeoui-daero, Yeongdungpo-gu, Seoul, 07366, South Korea.

4. On information and belief, Defendant LGEUS is a Delaware corporation with regular and established places of business within this District at 2153-2155 Eagle Pkwy, Fort Worth, TX 76177 and 14901 Beach St, Fort Worth, TX 76177.

5. On information and belief, Defendant LGEUS is a wholly owned subsidiary of Defendant LGE. Defendant LGEUS may be served with process through its Texas registered agent, United States Corporation Company, 211 E. 7th Street, Suite 620, Austin, Texas 78759.

6. Defendants are engaged (including, as relevant, in the past) in making, using, selling, offering for sale, and/or importing, and/or inducing one another and their respective subsidiaries, affiliates, distributors, suppliers, retail partners, and customers in the making, using, selling, offering for sale, and/or importing throughout the United States, including within this District, LGE and LGEUS products (*e.g.*, TVs, monitors, laptops, tablets, mobile phones) comprising Quantum Dots (the "Accused Products").

7. On information and belief, LGEUS provides (and has provided) sales, distribution, research, and/or development support in the United States. And LGE and/or LGEUS have imported and continue to import Accused Products into the United States and this District.

8. On information and belief, LGE controls (and has controlled) LGEUS, as well as many other subsidiaries, within the supply chain of Accused Products that were shipped to the United States. On information and belief, LGEUS provides (and has provided) sales, distribution, research, and development support in the United States for its parent LGE, which wholly owns

LGEUS. LGEUS is, and has been, an agent of LGE. At the direction and control of LGE, U.S.-based sales and/or distribution subsidiaries including, LGEUS, have imported and continue to import Accused Products into the United States and this District.

9. On information and belief LGE controls (and has controlled) LGEUS. On information and belief, each of these related companies and other LG companies are, and have been, agents of LGE. For example, LGE and LGEUS use the same logo, further emphasizing that these companies are alter egos and/or agents of one another.

10. On information and belief, LGE and LGEUS, along with their respective foreign and U.S.-based subsidiaries, affiliates, distributors, retail partners, and customers (which act as part of a global network and supply chain of overseas sales and manufacturing subsidiaries), have operated as agents of one another and vicariously as parts of the same business group to work in concert together and enter into agreements that are nearer than arm's length to provide (and have provided) a distribution channel of infringing products within this District and the U.S. nationally.

11. LGE and LGEUS operate (and have operated) in agency with their respective foreign and U.S.-based subsidiaries, affiliates, distributors, retail partners, suppliers, and customers, to provide a distribution channel of infringing products within this District and the U.S. nationally. LGE and LGEUS, individually and/or between one another and their respective agents and foreign and U.S.-based subsidiaries, affiliates, distributors, retail partners, suppliers, and customers, purposefully direct (and have directed) the Accused Products into established distribution channels within this District and the U.S. nationally.

12. On information and belief, LGE and LGEUS, including their respective U.S.-based subsidiaries, affiliates, distributors, retail partners, and customers (which act as part of a global network and supply chain of overseas sales and manufacturing subsidiaries), have operated as

agents of one another and vicariously as parts of the same business group to work in concert together and enter into agreements that are nearer than arm's length. LGE and LGEUS, and their U.S.-based sales subsidiaries, individually and/or in concert, conduct business (and have conducted business) in the United States, including importing, distributing, offering to sell, and selling the Accused Products that incorporate devices, systems, and processes that infringed the Patents-in-Suit in Texas and this District.

13. Through offers to sell, sales, imports, distributions, and other related agreements to transfer ownership of Defendants' Accused Products by and/or to affiliates, distributors, subsidiaries, suppliers, retail partners, customers, agents, and/or other Defendants, Defendants are operating in (and have operated in) and maintaining (and maintained) a significant business presence in the U.S. and/or through their U.S. subsidiaries or agents, Defendants do business in the U.S., the state of Texas, and in the Eastern District of Texas.

14. On information and belief, Defendants place, have placed, and contributed to placing Accused Products into the stream of commerce via an established distribution channel knowing or understanding that such products would be sold and used in the United States, including in this judicial district. On information and belief, Defendants have also derived substantial revenues from infringing acts in this District, including from the sale and use of the Accused Products.

15. On information and belief, LGE is liable for any act for which LGEUS and its other subsidiaries would be or would have been liable, including for any infringement alleged in this matter, and references herein should be understood to encompass such acts by LGE.

JURISDICTION AND VENUE

16. This action includes a claim of patent infringement arising under the patent laws of the United States, 35 U.S.C. §§ 1 *et seq*. This Court has jurisdiction over this action pursuant to 28 U.S.C. §§ 1331 and 1338(a).

17. This Court has personal jurisdiction over Defendants. On information and belief, Defendants conduct business, have committed acts of patent infringement directly or through subsidiaries, and have induced acts of patent infringement by others in this District and elsewhere in the United States. On information and belief, Defendants place, have placed, and contribute to placing their products into the stream of commerce through established distribution channels knowing or understanding that such products would be sold and used in the United States, including in this District.

18. Defendants are subject to personal jurisdiction under the provisions of the Texas Long Arm Statute, Tex. Civ. Prac. & Rem. Code § 17.041 *et seq*., by virtue of the fact that, upon information and belief, Defendants have availed themselves of the privilege of conducting and soliciting business within the State, including engaging in at least some of the infringing activities in this State, as well as by others acting as Defendants' agents and/or representatives, such that it would be reasonable for this Court to exercise jurisdiction consistent with principles underlying the U.S. Constitution, and the exercise of jurisdiction by this Court would not offend traditional notions of fair play and substantial justice.

19. With respect to LGE, venue is proper in this District pursuant to 28 U.S.C. §§ 1391(c). The foreign Defendants are foreign entities and may be sued in any judicial district under 28 U.S.C. § 1391(c)(3).

20. With respect to LGEUS, venue is proper in this District under 28 U.S.C. § 1400(b). LGEUS has committed acts of infringement in the District and/or has induced acts of patent infringement by others in this District and has a regular and established place of business within the District. For example, LGEUS has regular and established places of businesses, including a distribution facility, within this District at 2153-2155 Eagle Pkwy, Fort Worth, TX 76177 and 14901 Beach St, Fort Worth, TX 76177. In addition, the LGE and LGEUS have conceded that venue is proper in this district in other recent patent infringement actions. *See e.g.*, *Celerity IP, LLC v. LG Elecs*., No. 2:23-cv-0316-JRG-RSP (E.D. Tex. Nov. 27, 2023) at ¶ 13; *SpaceTime3D, Inc. v. LG Elecs, Inc*., No, 2:22-CV-00049- RWS, Dkt. 19 (E.D. Tex. June 20, 2022) at ¶¶ 18-19; *WFR IP LLC v. LG Elecs*., No. 2:22-CV-00245-RWS-RSP (E.D. Tex. Nov. 23, 2022), Dkt. 16 at ¶ 6; *Arigna Tech. Ltd., LG Elecs., Inc*., No. 2:21-cv-00377, (E.D. Tex. Jan. 26, 2022) Dkt. 24 at ¶¶ 13-14; *Hardin v. LG Elecs., Inc.*, No. 2:21-cv-00289, (E.D. Tex. Nov. 22, 2021) Dkt. 14 at ¶ 6; *Seven Networks, LLC v. LG Elecs., Inc*., No. 2:21-cv-88, (E.D. Tex. June 7, 2021) Dkt. 12 at ¶ 5.

21. LGE and LGEUS, directly or through their subsidiaries or intermediaries (including distributors, retailers, and others), ship, distribute, make, use, offer for sale, sell, import, repair and/or advertise (including by providing interactive web pages) products and/or services in the United States and the Eastern District of Texas and/or contribute to and actively induce customers to ship, distribute, make, use, offer for sale, sell, import, repair and/or advertise (including the provision of interactive web pages) infringing products in the United States and the Eastern District of Texas.

22. Joinder of Defendants is proper under 35 U.S.C. § 299.

23. The allegations of patent infringement contained herein arise out of the same series of transactions or occurrences relating to the importing, selling, or offering for sale within the

United States, the same Accused Products, including "QNED" LG products comprising Quantum Dots.

ASSERTED PATENTS

24. United States Patent No. 7,588,828 ("the '828 patent"), titled "Preparation of nanoparticle materials," generally relates to the synthesis of nanoparticles using molecular compounds comprising groups 12 and 16 ions as well as groups 13 and 15 ions.

25. United States Patent No. 8,524,365 ("the '365 patent"), tilted "Preparation of nanoparticle materials," generally relates to the synthesis of nanoparticles by effecting the conversion of nanoparticle precursor compositions into the material of the nanoparticle.

26. United States Patent No. 7,803,423 ("the '423 patent"), titled "Preparation of nanoparticle materials," generally relates to the synthesis of nanoparticles by effecting the conversion of nanoparticle precursor compositions into the material of the nanoparticle.

27. United States Patent No. 7,867,557 ("the '557 patent"), titled "Nanoparticles," generally relates to the synthesis of a nanoparticle comprised of a core, first outer shell, and second outer shell.

28. The Asserted Patents are each valid and enforceable.

29. The Asserted Patents are directed to improvements in nanoparticle technology, including quantum dots. Quantum dots are small, semiconductor particles that have unique optical and electronic properties, including the ability to produce pure monochromatic red, green, and/or blue light. The Asserted Patents are directed to improving quantum dots and the methods by which there are made, including by removing cadmium from the process and particles. Cadmium is toxic, and it was thus banned from use in consumer electronics in many countries.

30. The Asserted Patent solve this problem and other similar problems in this field by

converting precursors (such as an indium-containing precursor and a phosphorus-containing precursor) into a quantum dot core in the presence of a molecular cluster compound. Nanoco's patented "cluster assisted" growth methods enabled large-scale synthesis of high-quality, uniform, cadmium-free quantum dots.

31. Accordingly, the Asserted Patents are not directed to an abstract idea.

32. Moreover, the Asserted Patents contain an inventive concept and the inventions contained therein are not well-understood, routine, or conventional.

33. The Asserted Patents describe and claim the cadmium-free particles and associated processes for manufacturing these particles. In particular, the Asserted Patents describe use of less toxic elements, for example from columns 13 and 15 of the periodic table (group III-V), an example being indium phosphide ("InP"). Converting precursors (such as an indium-containing precursor and a phosphorus-containing precursor) into a quantum dot core in the presence of a molecular cluster compound was not well-understood, routine, or conventional.

34. Indeed, the Patent Trial and Appeal Board ("PTAB") has analyzed the validity of over 40 different claims across the Asserted Patents, and issued Final Written Decisions confirming the novelty and non-obviousness of the Asserted Patents in view of the prior art.[1]

35. Accordingly, the Asserted Patents are directed to patent-eligible subject matter and are valid and enforceable.

36. Nanoco owns all rights, title, and interest in and to the '828 patent, the '365 patent, the '423 patent, and the '557 patent, and possesses all rights of recovery.

FACTUAL ALLEGATIONS

37. Nanoco established its research and manufacturing headquarters in 2001, and since

[1] *See* IPR2021-00183, IPR2021-00184, IPR2021-00185, and IPR2021-00186.

then has been a leading innovator in nanoparticle and quantum dot technology. Originally born from a university research group, Nanoco has since transformed into a pioneer in the quantum dot industry as a result of innovating in the areas of heavy metal free quantum dots and "molecular seeding" processes for the large-scale synthesis of quantum dots.

38. A widespread commercial application is using a quantum dot enhancement film (QDEF) layer to improve the LED backlighting in LCD TVs. In this application, light from a blue LED backlight is converted by quantum dots to relatively pure red and green. This combination of blue, green and red light incurs less blue-green crosstalk and light absorption in the color filters after the LCD screen, thereby increasing useful light throughput and providing a better color gamut.

39. The QDEF layer is able to replace a diffuser used in traditional LCD backlight units.

40. The use of quantum dots to produce monochromatic red, green and blue light is an improvement over traditional LCD backlight units which fed a blue LED through a yellow filter to create white light which was then passed through red, green and blue color filters.

41. Nanoco's heavy metal-free quantum dots mitigate health risks presented by the use of quantum dots containing cadmium, mercury, lead and chromium in commercial applications.

42. Nanoco also solved a key problem related to quantum dots: the unique capability to scale-up from lab to volume production.

43. Quantum dots created using Nanoco's patented innovations have improved the visual aspects of consumer electronic display devices and made their large-scale synthesis and implementation commercially viable. Accordingly, quantum dots created by Nanoco's patented innovations have become fundamental components of many premium LED TV models.

44. In recognition of its innovations, Nanoco has been awarded hundreds of patents, and, to date, has amassed one of the largest intellectual property portfolios in quantum dot

technology.

45. Numerous companies have taken a license to Nanoco's quantum dot patents, and Nanoco has also entered joint development agreements with major electronics companies in connection with the use of Nanoco's cadmium-free quantum dots.

46. One widely publicized agreement for use of Nanoco's quantum dot patents was the 2023 license between Nanoco and Samsung valued at $150M.[2] On information and belief, LG was aware or would have been made aware of this license and LG's licensed quantum dot patents on or around the time of its reporting in 2023 in the technical and legal press.

47. Further, Nanoco has entered supply agreements with manufacturing companies for the production and distribution of optical films containing quantum dots.

48. LG engaged with Nanoco as early as 2007 in order to evaluate Nanoco's quantum dot technology for use in the emission material of LG's products.

49. Between 2012 and 2017, Nanoco and LG worked closely together on quantum dot technology for use in LG's displays. As part of this engagement, Nanoco provided samples of its quantum dots to LG.

50. During this time, Nanoco frequently met with and shared presentations to LG representatives about Nanoco's cadmium-free quantum dot technology. Nanoco representatives visited LG sites in Korea and elsewhere to meet with LG representatives about Nanoco's cadmium-free quantum dot technology.

51. On or around 2015, LG showcased its first quantum dot TV at the Consumer Electronics Show, "CES" in Las Vegas.[3] The LG display product actually incorporated Nanoco's

[2] https://www.reuters.com/legal/samsung-led-settlement-worth-150-million-nanotech-firm-says-2023-02-03/
[3] https://www.forbes.com/sites/johnarcher/2015/01/07/ces-2015-hands-on-with-lgs-new-4k-oled-and-colorprime-tvs/

red quantum dots.

52. These interactions between Nanoco and LG did not result in a license for LG to use Nanoco's patented innovations or a supply agreement for Nanoco to provide LG with its patented quantum dots. And despite showcasing a quantum dot TV in 2015, LG did not mass-produce quantum dot TVs at that time.

53. Six years later, however, LG debuted a new TV comprising quantum dots at the 2021 Consumer Electronics Show, "CES."[4]

54. LG began incorporating cadmium-free quantum dot technology in its TV displays at scale on or around 2021 when it launched its "QNED" brand of products:[5]

[4] https://www.lg.com/us/PDF/press-release/CES-2021-LG-QNED-Mini-LED-TV-Release-FINAL-12-28-2020.pdf
[5] https://www.lgcorp.com/media/release/23052 ("An exciting addition for 2021, QNED Mini LED TVs take LCD TV picture quality to the next level. Available in an array of 8K (models QNED99, QNED95) and 4K (models QNED90, QNED85) and 4K options, these models employ LG's Quantum Dot NanoCell technology and Mini LED backlighting to achieve deeper blacks, more vibrant, accurate colors and greater contrast than conventional LCD televisions.").

55. Since its launch, LG credits quantum dot technology for increasing brightness and contrast in its "QNED" products: "Thanks to quantum dot and NanoCell technologies with Mini LEDs as the light source, brightness and contrast are far superior to that of conventional LCD televisions."[6]

56. LG's QNED products make use of Nanoco's patented cadmium free quantum dot technology.

57. The technologies disclosed and claimed in the Patents-in-Suit generally relate to heavy metal-free quantum dots and synthesis of quantum dots.

58. On information and belief, the Accused Products include all LG products containing quantum dots.[7]

59. Defendants have been aware of Nanoco's patents, including but not limited to the '828 Patent, since at least March 2012 when Nanoco identified the '828 Patent to LG in connection with the use of molecular seeding to synthesize InP quantum dots.

60. On information and belief, LG reviewed the Patents-in-Suit as part of the parties' discussions during the 2007 to 2017 timeframe.

61. Additionally, Defendants have been aware of all Patents-in-Suit by Nanoco since, at least, October 11, 2023 when Nanoco wrote to LG regarding LG's QNED products and the Patents-in-Suit.

62. Additionally, Defendants have been aware of the Patents-in-Suit no later than the date when Nanoco filed this lawsuit detailing Defendants' infringing acts based on each of these Patents-in-Suit.

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[6] https://www.lg.com/us/PDF/press-release/CES-2021-LG-QNED-Mini-LED-TV-Release-FINAL-12-28-2020.pdf

[7] The Accused Products include, by way of example and not limitation, all models, sizes, and variants found within the LG QNED75 Series; the LG QNED80 Series; the LG QNED 80T Series; the LG QNED81 Series; the LG QNED82T Series; the LG QNED85 Series; the LG QNED85T Series; the LG QNED88T Series; the LG QNED90 Series; the LG QNED90T Series; the LG QNED95 Series; the LG QNED99 Series; and the LG QNED99T Series. Discovery may reveal the existence of additional infringing products/series.

63. In the interest of providing detailed averments of infringement, Nanoco has identified below at least one claim of the Patents-in-Suit to demonstrate infringement. However, the selection of claims should not be considered limiting, and additional claims of the Patents-in-Suit that are infringed by LG will be disclosed in compliance with the Court's schedule.

COUNT ONE: INFRINGEMENT OF THE '828 PATENT

64. Nanoco incorporates by reference the preceding paragraphs as if fully set forth herein.

65. U.S. Patent No. 7,588,828 ("the 828 Patent"), entitled "Preparation of nanoparticle materials" was legally and duly issued on September 15, 2009. *See* Exhibit 1.

66. Nanoco owns all rights, title, and interest in the '828 Patent, and holds all substantial rights pertinent to this suit, including the right to sue and recover for all past, current, and future infringement.

67. Nanoco has complied with all statutory requirements, including the requirements of 35 U.S.C. § 287, to pursue and recover for any infringement of the '828 Patent.

68. On information and belief, LG directly infringed and is currently infringing, literally and/or under the doctrine of equivalents, at least one claim of the '828 Patent by, among other things, making, using, selling, offering to sell, and/or importing within this District and elsewhere in the United States, without authority, the Accused Products. For example, as shown below, the Accused Products practice at least claim 14 of the '828 Patent.

69. Claim 14 of the '828 Patent recites:

> [Pre] A method of producing nanoparticles, the method comprising the steps of:
>
> [1a] providing a nanoparticle precursor composition comprising group 13 ions and group 15 ions; and

> [1b] effecting conversion of the nanoparticle precursor into nanoparticles,
>
> [1c] wherein said conversion is effected in the presence of a molecular cluster compound incorporating group 12 ions and group 16 ions under conditions permitting nanoparticle seeding and growth.

70. For purposes of showing infringement of the '828 Patent, on information and belief, all the series and models of LG's Accused Products share the same or substantially the same nanoparticle structure and composition produced according to the method patented and recited in claim 14 of the '828 Patent, and therefore infringe in the same way.

71. The Accused Products contain quantum dots.[8]

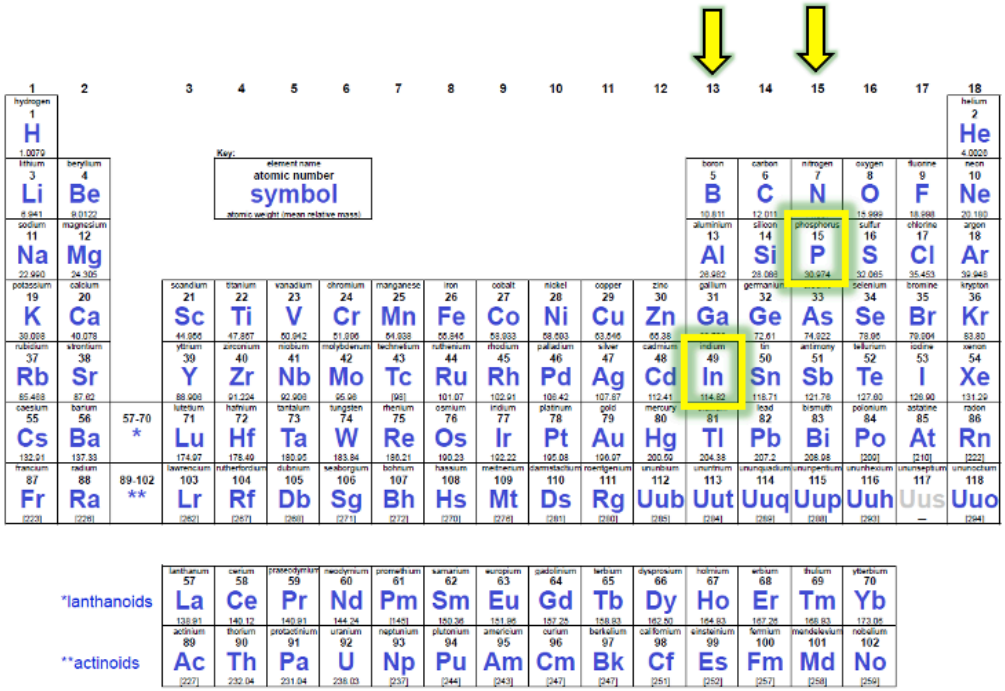
[8] *See, e.g.*, https://www.lg.com/us/qned-tvs?gad_source=1&gclid=Cj0KCQjw-e6-BhDmARIsAOxxlxUzp0e5b2xm0AmxvJAKoSNDFe4sDUykVr0fs6OTYSNaxmgQzddv47kaAnOkEALw_wcB&gclsrc=aw.ds; https://www.lg.com/levant_en/qned-tvs/2022/why-lg-qned ("LG QNED mini LED is a mini LED TV that combines NanoCell and Quantum Dot technology."); https://www.lg.com/levant_en/qned-tvs/2022/gaming ("Quantum Dot and NanoCell bring lifelike color and detail to your game for next-level immersion."); https://www.lg.com/my/lg-experience/helpful-hints/lg-screen-technology-explained/#:~:text=QNED%20TVs%20come%20with%20Quantum,purer%20colours%20with%20more%20depth ("QNED TVs come with Quantum Dot and NanoCell technology, offering a premium picture display with accurate colour representation. Nanoparticles – which are integrated into the panel itself[.]").

72. The Accused Products "come with quantum dot" technology "integrated into the panel itself."[9] Quantum dots are nanoparticles.[10]

> QNED TVs come with Quantum Dot and NanoCell technology, offering a premium picture display with accurate colour representation. Nanoparticles – which are integrated into the panel itself – act as a filter to remove impurities in light wavelengths. This means that you'll be able to enjoy purer colours with more depth.

73. The Accused Products contain quantum dots that are made by providing a nanoparticle precursor composition comprising group 13 ions and group 15 ions. On information and belief, Accused Products contain quantum dots that are made by providing a precursor composition comprising Indium (group 13) and Phosphorous (group 15):

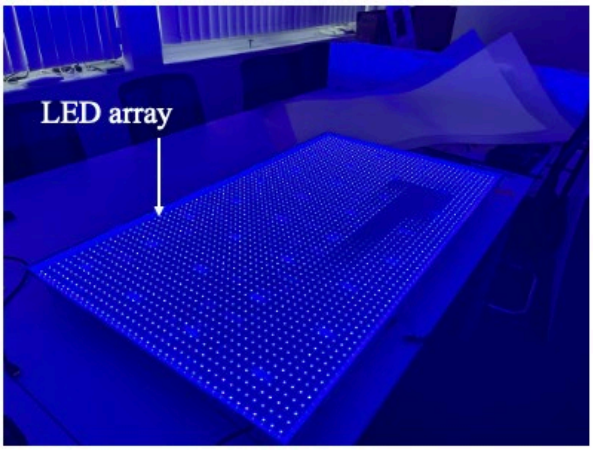
[9] https://www.lg.com/my/lg-experience/helpful-hints/lg-screen-technology-explained/#:~:text=QNED%20TVs%20come%20with%20Quantum,purer%20colours%20with%20more%20depth ("QNED TVs come with Quantum Dot and NanoCell technology, offering a premium picture display with accurate colour representation. Nanoparticles – which are integrated into the panel itself[.]").
[10] *Id.*

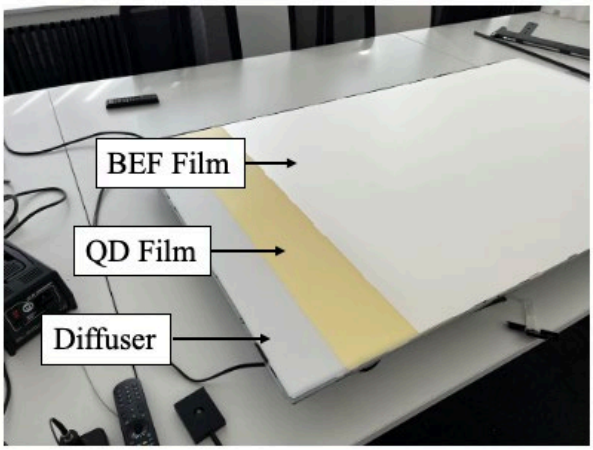


74. The LG 65QNED90 TV is representative of all Accused Products, and the infringing features present in the LG 65QNED90 TV product are common in all of the Accused Products.

75. For example, the LG 65QNED90 TV consists of a blue min-LED edge backlit system comprising, *inter alia*, a mini-LED array, diffuser plate, a quantum dot film, and a brightness enhancement optical film:[11,12]

[11] https://www.amazon.com/dp/B0CVSJMZCT?ref_=ppx_hzsearch_conn_dt_b_fed_asin_title_1&th=1
[12] Teardown of LG 65QNED90 TV.



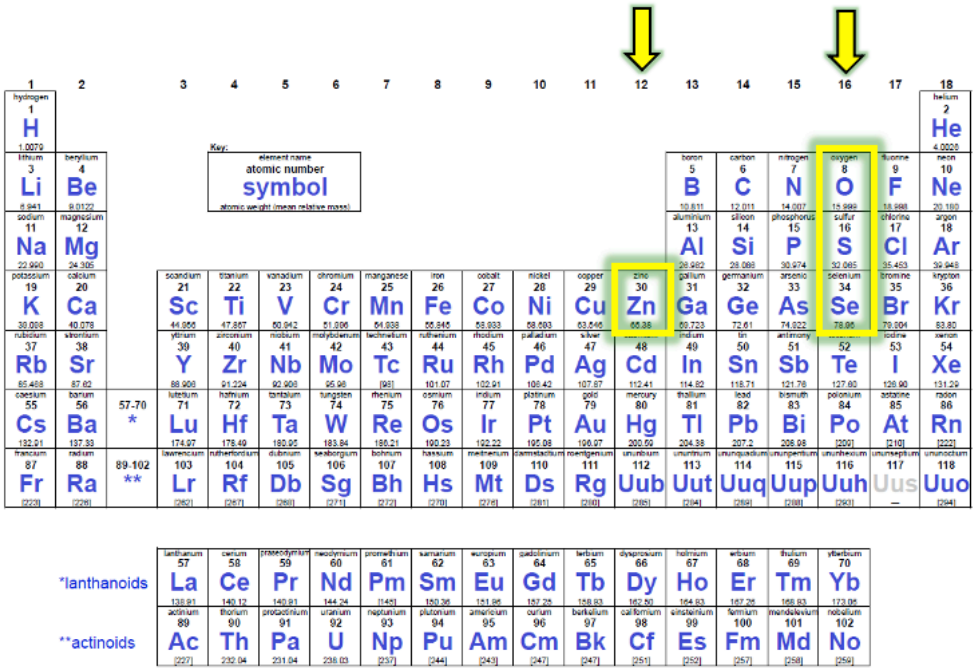


76. The quantum dots in the LG 65QNED90 TV are InP quantum dots that, on information and belief, are made by providing a precursor composition comprising Indium (group 13) and Phosphorous (group 15).

77. The Accused Products contain quantum dots that are made by converting the nanoparticle precursor into nanoparticles. The quantum dots are made according to a synthesis process which converts a nanoparticle precursor composition to a material of the nanoparticles.

78. The quantum dots in the LG 65QNED90 TV are InP quantum dots that, on information and belief, are made from the conversion of the precursors comprising Indium (group 13) and Phosphorous (group 15) into the nanoparticle quantum dot.

79. In synthesizing the quantum dots in the Accused Products, said conversion is effected in the presence of a molecular cluster compound incorporating group 12 ions and group 16 ions. On information and belief, a molecular cluster compound is formed during said conversion, which incorporates Zinc (Group 12) and Oxygen, Selenium, and/or Sulfur (Group 16) ions:



80. O, S, and Se are ions from group 16 of the periodic table. Group 16 elements include: O, S, Se, Te, Po, and Uuh. Further, Zn is an ion from group 12 of the periodic table. Group 12 elements include: Zn, Cd, Hg, and Cn.

81. The conversion is effected under conditions permitting seeding and growth of nanoparticles. The synthesis used to make the quantum dots found in the Accused Products uses the molecular cluster compound to aid the formation and growth of the quantum dot cores.

82. The quantum dots in the LG 65QNED90 TV are cadmium-free InP quantum dots that, on information and belief, convert the precursors comprising Indium (group 13) and Phosphorous (group 15) into quantum dots in the presence of a molecular cluster compound incorporating group 12 ions and group 16 ions. The quantum dots in the LG 65QNED90 TV also comprise Zinc (group 12), and one or more of Sulfur, Selenium, and Oxygen (Group 16).

83. Accordingly, the Accused Products contain quantum dots that are made using each and every step in claim 14 of the '828 Patent.

84. LG has violated 35 U.S.C. § 271(g) by unlawfully importing into the United States or offering to sell, selling, or using within the United States, at least, the Accused Products incorporating quantum dots made by a process that infringes at least independent claim 14 of the '828 patent.

85. LG indirectly infringes the '828 Patent because it has induced third parties, including customers, subsidiaries and wholly- or partially-owned companies, end users, distributors, and/or retailers, to have made, use, offer for sale, sell, and/or import the Accused Products without Nanoco's permission in violation of 35 U.S.C. § 271(b).

86. Based on information and belief, third parties, including customers, subsidiaries and wholly- or partially-owned companies, end users, distributors, and/or retailers, have directly infringed the '828 Patent by having made, using, offering for sale, selling, and/or importing the Accused Products, including, for example, by manufacturing, configuring, using, selling, and operating the Accused Products.

87. LG induced these third parties' direct infringement by advertising, encouraging, instructing, providing support for, and/or operating the Accused Products for or on behalf of such third parties. For example, on information and belief, LGE induces LGEUS to import, market,

offer to sell, and sell the Accused Products within the United States. Also, LG publishes specifications, datasheets, instruction manuals, support materials, developer materials, marketing materials, and user guide materials that explain, advertise, instruct on, or provide support for the Accused Products.

88. LG took the above actions intending to cause infringing acts by these third parties.

89. If LG did not know that the actions it encouraged constituted infringement of the '828 Patent, LG was willfully blind as to its inducing infringement of others. LG subjectively believed that there was a high probability that others would infringe the '828 Patent but took deliberate steps to avoid confirming that it was actively inducing infringement by others.

90. LG knew of the '828 Patent since at least March 2012 when Nanoco identified the '828 Patent to LG in connection with the use of molecular seeding to synthesize InP quantum dots.

91. Additionally, LG has also been on notice of '828 Patent since at least October 11, 2023 when Nanoco identified the '828 Patent to LG in written communication responsive to LG's announcement and release of QNED products.

92. Additionally, LG has been on notice of the '828 Patent no later than the filing and service of this Complaint.

93. Nanoco has sustained damages owing to LG's infringement of the '828 Patent.

94. LG had knowledge of the '828 Patent and knew its actions constituted infringement of the '828 Patent, or at least subjectively believed that there was a high probability that the '828 Patent existed and took deliberate actions to avoid learning of the '828 Patent.

95. LG's infringement of the '828 Patent is exceptional and Nanoco is entitled to recover reasonable attorneys' fees incurred in prosecuting this action in accordance with 35 U.S.C. § 285.

COUNT TWO: INFRINGEMENT OF THE '365 PATENT

96. Nanoco incorporates by reference the preceding paragraphs as if fully set forth herein.

97. U.S. Patent No. 8,524,365 ("the '365 Patent"), entitled "Preparation of nanoparticle materials" was legally and duly issued on September 3, 2013. *See* Exhibit 4.

98. Nanoco owns all rights, title, and interest in the '365 Patent, and holds all substantial rights pertinent to this suit, including the right to sue and recover for all past, current, and future infringement.

99. Nanoco has complied with all statutory requirements, including the requirements of 35 U.S.C. § 287, to pursue and recover for any infringement of the '365 Patent.

100. On information and belief, LG directly infringed and is currently infringing, literally and/or under the doctrine of equivalents, at least one claim of the '365 Patent by, among other things, making, using, selling, offering to sell, and/or importing within this District and elsewhere in the United States, without authority, the Accused Products. For example, as shown below, the Accused Products practice at least claim 1 of the '365 Patent.

101. Claim 1 of the '365 Patent recites:

> [1a] A nanoparticle comprising a molecular cluster compound and a core semiconductor material disposed on the molecular cluster compound,
>
> [1b] wherein the semiconductor material comprises one or more elements not comprised within the molecular cluster compound.

102. For purposes of showing infringement of the '365 Patent, on information and belief, all the series and models of LG's Accused Products share the same nanoparticle structure and composition, and therefore infringe in the same way.

103. The Accused Products contain quantum dots.[13]

104. The Accused Products "come with quantum dot" technology "integrated into the panel itself."[14] Quantum dots are nanoparticles.[15]

[13] *See, e.g.*, https://www.lg.com/us/qned-tvs?gad_source=1&gclid=Cj0KCQjw-e6-BhDmARIsAOxxlxUzp0e5b2xm0AmxvJAKoSNDFe4sDUykVr0fs6OTYSNaxmgQzddv47kaAnOkEALw_wcB&gclsrc=aw.ds; https://www.lg.com/levant_en/qned-tvs/2022/why-lg-qned ("LG QNED mini LED is a mini LED TV that combines NanoCell and Quantum Dot technology."); https://www.lg.com/levant_en/qned-tvs/2022/gaming ("Quantum Dot and NanoCell bring lifelike color and detail to your game for next-level immersion."); https://www.lg.com/my/lg-experience/helpful-hints/lg-screen-technology-explained/#:~:text=QNED%20TVs%20come%20with%20Quantum,purer%20colours%20with%20more%20depth ("QNED TVs come with Quantum Dot and NanoCell technology, offering a premium picture display with accurate colour representation. Nanoparticles – which are integrated into the panel itself[.]").

[14] https://www.lg.com/my/lg-experience/helpful-hints/lg-screen-technology-explained/#:~:text=QNED%20TVs%20come%20with%20Quantum,purer%20colours%20with%20more%20depth ("QNED TVs come with Quantum Dot and NanoCell technology, offering a premium picture display with accurate colour representation. Nanoparticles – which are integrated into the panel itself[.]").

[15] *Id.*

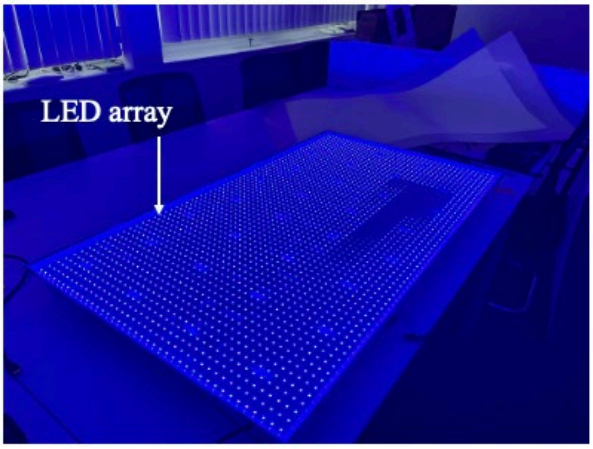
> QNED TVs come with Quantum Dot and NanoCell technology, offering a premium picture display with accurate colour representation. Nanoparticles – which are integrated into the panel itself – act as a filter to remove impurities in light wavelengths. This means that you'll be able to enjoy purer colours with more depth.

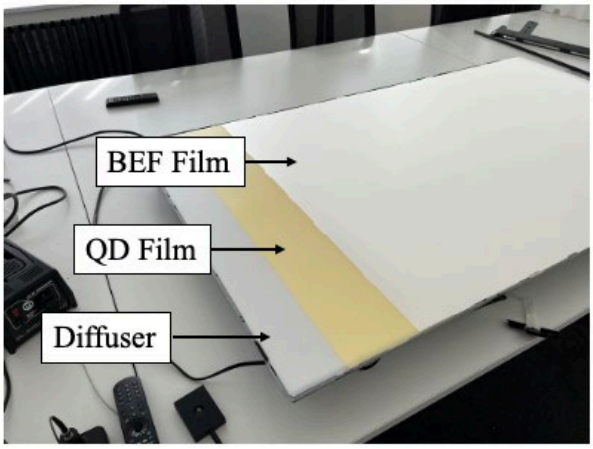
105. The Accused Products contain quantum dots that comprise a molecular cluster compound and a core semiconductor material disposed on the molecular cluster compound.

106. The LG 65QNED90 TV is representative of all Accused Products, and the infringing features present in the LG 65QNED90 TV product are common in all of the Accused Products.

107. For example, the LG 65QNED90 TV consists of a blue min-LED edge backlit system comprising, *inter alia*, a mini-LED array, diffuser plate, a quantum dot film, and a brightness enhancement optical film:[16,17]

[16] https://www.amazon.com/dp/B0CVSJMZCT?ref_=ppx_hzsearch_conn_dt_b_fed_asin_title_1&th=1
[17] Teardown of LG 65QNED90 TV.





108. Upon information and belief, the quantum dots in the Accused Products are made with a core semiconductor material comprising Indium and Phosphorus.

109. For example, the quantum dots in the LG 65QNED90 TV are cadmium-free InP quantum dots that contain a core semiconductor material comprising Indium and Phosphorous.

110. During synthesis of the quantum dots in the Accused Products, a molecular cluster compound incorporating group 12 ions and group 16 ions is formed.

111. The quantum dots in the LG 65QNED90 TV also comprise Zinc (group 12), and one or more of Sulfur, Selenium, and Oxygen (Group 16). On information and belief, in the quantum dots in the LG 65QNED90 TV the abovementioned core semiconductor material is disposed on a molecular cluster compound.

112. Upon information and belief, the quantum dots in the Accused Products comprise a core semiconductor material disposed on the molecular cluster compound. In particular, the quantum dots in the Accused Products comprise Indium and Phosphorus (In-P) cores that grow from the surface of the molecular cluster compound.

113. The Accused Products contain quantum dots wherein the semiconductor material comprises one or more elements not comprised within the molecular cluster compound.

114. For example, upon information and belief, Indium is in the semiconductor material but not within the molecular cluster compound.

115. Accordingly, the Accused Products contain each and every element in claim 1 of the '365 Patent.

116. LG directly infringed the '365 Patent, alone or jointly, literally and/or under the doctrine of equivalents, because it made, used, offered for sale, sold, and/or imported the Accused Products in the United States without Nanoco's permission in violation of 35 U.S.C. § 271(a).

117. LG indirectly infringes the '365 Patent because it has induced third parties, including customers, subsidiaries and wholly- or partially-owned companies, end users, distributors, and/or retailers, to have made, use, offer for sale, sell, and/or import the Accused Products without Nanoco's permission in violation of 35 U.S.C. § 271(b).

118. Based on information and belief, third parties, including customers, subsidiaries and wholly- or partially-owned companies, end users, distributors, and/or retailers, have directly infringed the '365 Patent by having made, using, offering for sale, selling, and/or importing the Accused Products, including, for example, by manufacturing, configuring, using, selling, and operating the Accused Products.

119. LG induced these third parties' direct infringement by advertising, encouraging, instructing, providing support for, and/or operating the Accused Products for or on behalf of such third parties. For example, on information and belief, LGE induces LGEUS to import, market, offer to sell, and sell the Accused Products within the United States. Also, LG publishes specifications, datasheets, instruction manuals, support materials, developer materials, marketing

materials, and user guide materials that explain, advertise, instruct on, or provide support for the Accused Products.

120. LG took the above actions intending to cause infringing acts by these third parties.

121. If LG did not know that the actions it encouraged constituted infringement of the '365 Patent, LG was willfully blind as to its inducing infringement of others. LG subjectively believed that there was a high probability that others would infringe the '365 Patent but took deliberate steps to avoid confirming that it was actively inducing infringement by others.

122. LG has also been on notice of '365 Patent since at least October 11, 2023, when Nanoco identified the '365 Patent to LG in written communication responsive to LG's announcement and release of QNED products.

123. Additionally, LG has been on notice of the '365 Patent no later than the filing and service of this Complaint.

124. Nanoco has sustained damages owing to LG's infringement of the '365 Patent.

125. LG had knowledge of the '365 Patent and knew its actions constituted infringement of the '365 Patent, or at least subjectively believed that there was a high probability that the '365 Patent existed and took deliberate actions to avoid learning of the '365 Patent.

126. LG's infringement of the '365 Patent is exceptional and Nanoco is entitled to recover reasonable attorneys' fees incurred in prosecuting this action in accordance with 35 U.S.C. § 285.

COUNT THREE: INFRINGEMENT OF THE '423 PATENT

127. Nanoco incorporates by reference the preceding paragraphs as if fully set forth herein.

128. U.S. Patent No. 7,803,423 ("the '423 Patent"), entitled "Preparation of nanoparticle materials" was legally and duly issued on September 28, 2010. *See* Exhibit 2.

129. Nanoco owns all rights, title, and interest in the '423 Patent, and holds all substantial rights pertinent to this suit, including the right to sue and recover for all past, current, and future infringement.

130. Nanoco has complied with all statutory requirements, including the requirements of 35 U.S.C. § 287, to pursue and recover for any infringement of the '423 Patent.

131. On information and belief, LG directly infringed and is currently infringing, literally and/or under the doctrine of equivalents, at least one claim of the '423 Patent by, among other things, making, using, selling, offering to sell, and/or importing within this District and elsewhere in the United States, without authority, the Accused Products. For example, as shown below, the Accused Products practice at least claim 1 of the '423 Patent.

132. Claim 1 of the '423 Patent recites:

> [1pre] A method of producing nanoparticles comprising:
>
> [1a] effecting conversion of a nanoparticle precursor composition to a material of the nanoparticles, said precursor composition comprising a first precursor species containing a first ion to be incorporated into the nanoparticles and a separate second precursor species containing a second ion to be incorporated into the nanoparticles,
>
> [1b] wherein said conversion is effected in the presence of a molecular cluster compound different from the first precursor species and the second precursor species under conditions permitting seeding and growth of the nanoparticles.

133. For purposes of showing infringement of the '423 Patent, on information and belief, all the series and models of LG's Accused Products share the same nanoparticle structure and

composition produced according to the method patented and recited in claim 1 of the '423 Patent, and therefore infringe in the same way.

134. The Accused Products contain quantum dots.[18]

135. The Accused Products "come with quantum dot" technology "integrated into the panel itself."[19] Quantum dots are nanoparticles.[20]

> QNED TVs come with Quantum Dot and NanoCell technology, offering a premium picture display with accurate colour representation. Nanoparticles – which are integrated into the panel itself – act as a filter to remove impurities in light wavelengths. This means that you'll be able to enjoy purer colours with more depth.

136. The Accused Products contain quantum dots that are produced by effecting

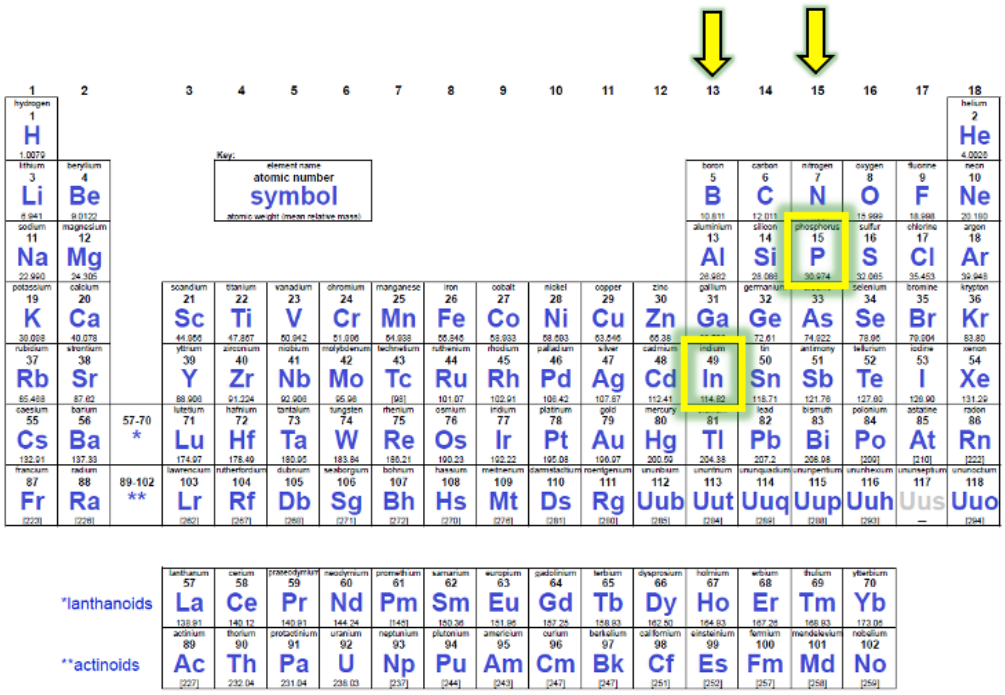
[18] *See, e.g.*, https://www.lg.com/us/qned-tvs?gad_source=1&gclid=Cj0KCQjw-e6-BhDmARIsAOxxlxUzp0e5b2xm0AmxvJAKoSNDFe4sDUykVr0fs6OTYSNaxmgQzddv47kaAnOkEALw_wcB&gclsrc=aw.ds; https://www.lg.com/levant_en/qned-tvs/2022/why-lg-qned ("LG QNED mini LED is a mini LED TV that combines NanoCell and Quantum Dot technology."); https://www.lg.com/levant_en/qned-tvs/2022/gaming ("Quantum Dot and NanoCell bring lifelike color and detail to your game for next-level immersion."); https://www.lg.com/my/lg-experience/helpful-hints/lg-screen-technology-explained/#:~:text=QNED%20TVs%20come%20with%20Quantum,purer%20colours%20with%20more%20depth ("QNED TVs come with Quantum Dot and NanoCell technology, offering a premium picture display with accurate colour representation. Nanoparticles – which are integrated into the panel itself[.]").

[19] https://www.lg.com/my/lg-experience/helpful-hints/lg-screen-technology-explained/#:~:text=QNED%20TVs%20come%20with%20Quantum,purer%20colours%20with%20more%20depth ("QNED TVs come with Quantum Dot and NanoCell technology, offering a premium picture display with accurate colour representation. Nanoparticles – which are integrated into the panel itself[.]").

[20] *Id.*

conversion of a nanoparticle precursor composition to a material of the nanoparticles.

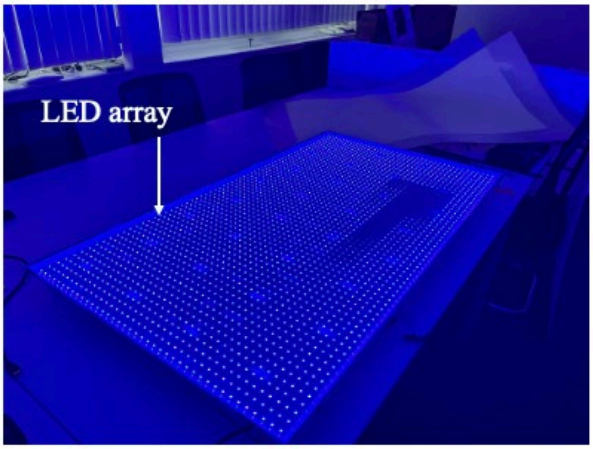
137. The Accused Products contain quantum dots that are produced by providing a nanoparticle precursor composition comprising group 13 ions and group 15 ions. On information and belief, the Accused Products contain quantum dots that are made by providing a precursor composition comprising Indium (group 13) and Phosphorous (group 15):

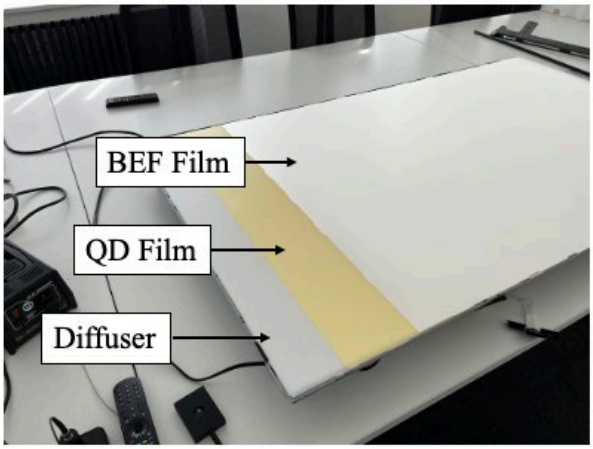


138. The LG 65QNED90 TV is representative of all Accused Products, and the infringing features present in the LG 65QNED90 TV product are common in all of the Accused Products.

139. For example, the LG 65QNED90 TV consists of a blue min-LED edge backlit system comprising, *inter alia*, a mini-LED array, diffuser plate, a quantum dot film, and a brightness enhancement optical film:[21,22]

[21] https://www.amazon.com/dp/B0CVSJMZCT?ref_=ppx_hzsearch_conn_dt_b_fed_asin_title_1&th=1
[22] Teardown of LG 65QNED90 TV.





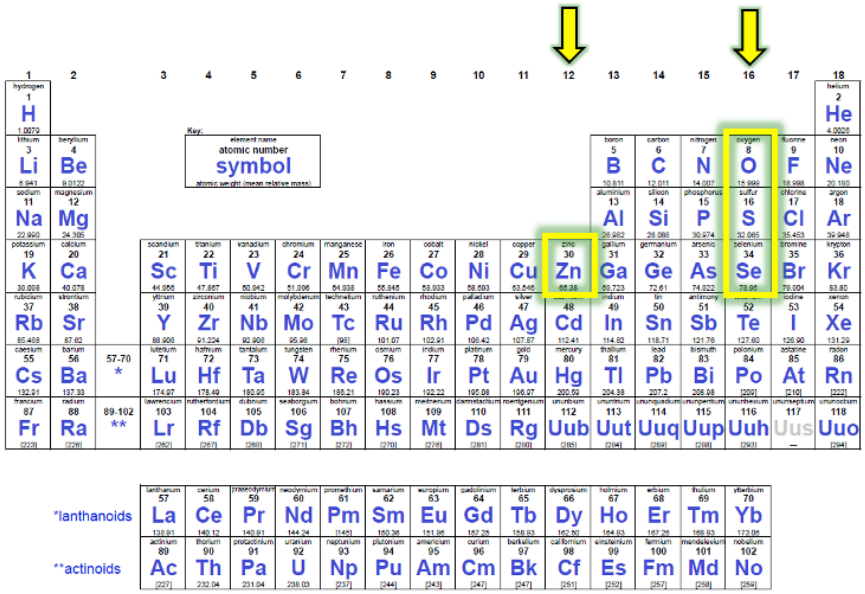
140. The quantum dots in the LG 65QNED90 TV are cadmium-free InP quantum dots that, on information and belief, are made by providing a precursor composition comprising Indium (group 13) and Phosphorous (group 15).

141. These first and second precursor species contain first and second ions, respectively, to be incorporated into the nanoparticles. The Indium precursor species contains Indium ions; the Phosphorus precursor species contains Phosphorus ions.

142. The Accused Products contain quantum dots that are made by converting the nanoparticle precursor into nanoparticles. The precursor composition is converted into the core of the quantum dots in the Accused Products, specifically In-P cores.

143. The quantum dots in the LG 65QNED90 TV are InP quantum dots that, on information and belief, are made from the conversion of the precursors comprising Indium (group 13) and Phosphorous (group 15) into the nanoparticle quantum dot.

144. In synthesizing the quantum dots in the Accused Products, said conversion is effected in the presence of a molecular cluster compound incorporating group 12 ions and group 16 ions. On information and belief, a molecular cluster compound is formed during said conversion which incorporates Zinc (Group 12) and Oxygen, Selenium, and/or Sulfur (Group 16) ions:



145. O, S, and Se are ions from group 16 of the periodic table. Group 16 elements include: O, S, Se, Te, Po, and Uuh. Further, Zn is an ion from group 12 of the periodic table. Group 12 elements include: Zn, Cd, Hg, and Cn.

146. The quantum dots in the LG 65QNED90 TV are cadmium-free InP quantum dots that, on information and belief, convert the precursors comprising Indium (group 13) and Phosphorous (group 15) into quantum dots in the presence of a molecular cluster compound incorporating group 12 ions and group 16 ions. The quantum dots in the LG 65QNED90 TV also comprise Zinc (group 12), and one or more of Sulfur, Selenium, and Oxygen (Group 16).

147. The group 12 and 16 molecular cluster compound is different from the first and second precursor species (Indium and Phosphorus). The conversion is effected under conditions permitting seeding and growth of nanoparticles. The synthesis used to make the quantum dots found in the Accused Products uses the molecular cluster compound to aid the formation and growth of the quantum dot cores.

148. Accordingly, the Accused Products contain each and every element in claim 1 of the ’423 Patent.

149. LG has violated 35 U.S.C. § 271(g) by unlawfully importing into the United States or offering to sell, selling, or using within the United States, at least, the Accused Products incorporating quantum dots made by a process that infringes at least independent claim 1 of the ’423 patent.

150. LG indirectly infringes the ’423 Patent because it has induced third parties, including customers, subsidiaries and wholly- or partially-owned companies, end users, distributors, and/or retailers, to have made, use, offer for sale, sell, and/or import the Accused Products without Nanoco’s permission in violation of 35 U.S.C. § 271(b).

151. Based on information and belief, third parties, including customers, subsidiaries and wholly- or partially-owned companies, end users, distributors, and/or retailers, have directly infringed the ’423 Patent by having made, using, offering for sale, selling, and/or importing the Accused Products, including, for example, by manufacturing, configuring, using, selling, and operating the Accused Products.

152. LG induced these third parties’ direct infringement by advertising, encouraging, instructing, providing support for, and/or operating the Accused Products for or on behalf of such third parties. For example, on information and belief, LGE induces LGEUS to import, market,

offer to sell, and sell the Accused Products within the United States. Also, LG publishes specifications, datasheets, instruction manuals, support materials, developer materials, marketing materials, and user guide materials that explain, advertise, instruct on, or provide support for the Accused Products.

153. LG took the above actions intending to cause infringing acts by these third parties.

154. If LG did not know that the actions it encouraged constituted infringement of the '423 Patent, LG was willfully blind as to its inducing infringement of others. LG subjectively believed that there was a high probability that others would infringe the '423 Patent but took deliberate steps to avoid confirming that it was actively inducing infringement by others.

155. LG has also been on notice of '423 Patent since at least October 11, 2023, when Nanoco identified the '423 Patent to LG in written communication responsive to LG's announcement and release of QNED products.

156. Additionally, LG has been on notice of the '423 Patent no later than the filing and service of this Complaint.

157. Nanoco has sustained damages owing to LG's infringement of the '423 Patent.

158. LG had knowledge of the '423 Patent and knew its actions constituted infringement of the '423 Patent, or at least subjectively believed that there was a high probability that the '423 Patent existed and took deliberate actions to avoid learning of the '423 Patent.

159. LG's infringement of the '423 Patent is exceptional and Nanoco is entitled to recover reasonable attorneys' fees incurred in prosecuting this action in accordance with 35 U.S.C. § 285.

COUNT FOUR: INFRINGEMENT OF THE '557 PATENT

160. Nanoco incorporates by reference the preceding paragraphs as if fully set forth herein.

161. U.S. Patent No. 7,867,557 ("the '557 Patent"), entitled "Nanoparticles" was legally and duly issued on January 11, 2011. *See* Exhibit 3.

162. Nanoco owns all rights, title, and interest in the '557 Patent, and holds all substantial rights pertinent to this suit, including the right to sue and recover for all past, current, and future infringement.

163. Nanoco has complied with all statutory requirements, including the requirements of 35 U.S.C. § 287, to pursue and recover for any infringement of the '557 Patent.

164. On information and belief, LG directly infringed and is currently infringing, literally and/or under the doctrine of equivalents, at least one claim of the '557 Patent by, among other things, making, using, selling, offering to sell, and/or importing within this District and elsewhere in the United States, without authority, the Accused Products. For example, as shown below, the Accused Products practice at least claim 1 of the '557 Patent.

165. Claim 1 of the '557 Patent recites:

> [1pre] A method for producing a nanoparticle comprised of a core comprising a core semiconductor material, a first layer comprising a first semiconductor material provided on said core and a second layer comprising a second semiconductor material provided on said first layer, said core semiconductor material being different to said first semiconductor material and said first semiconductor material being different to said second semiconductor material, the method comprising:
>
> [1a] effecting conversion of a nanoparticle core precursor composition to the material of the nanoparticle core;
>
> [1b] depositing said first layer on said core; and

> [1c] depositing said second layer on said first layer, said core precursor composition comprising a first precursor species containing a first ion to be incorporated into the growing nanoparticle core and a separate second precursor species containing a second ion to be incorporated into the growing nanoparticle core,
>
> [1d] said conversion being effected in the presence of a molecular cluster compound different from the nanoparticle core precursor composition.

166. For purposes of showing infringement of the '557 Patent, on information and belief, all the series and models of LG's Accused Products share the same nanoparticle structure and composition produced according to the method patented and recited in claim 1 of the '557 Patent, and therefore infringe in the same way.

167. The Accused Products contain quantum dots.[23]

[23] *See, e.g.*, https://www.lg.com/us/qned-tvs?gad_source=1&gclid=Cj0KCQjw-e6-BhDmARIsAOxxlxUzp0e5b2xm0AmxvJAKoSNDFe4sDUykVr0fs6OTYSNaxmgQzddv47kaAnOkEALw_wcB&gclsrc=aw.ds; https://www.lg.com/levant_en/qned-tvs/2022/why-lg-qned ("LG QNED mini LED is a mini LED TV that combines NanoCell and Quantum Dot technology."); https://www.lg.com/levant_en/qned-tvs/2022/gaming ("Quantum Dot and NanoCell bring lifelike color and detail to your game for next-level immersion."); https://www.lg.com/my/lg-experience/helpful-hints/lg-screen-technology-explained/#:~:text=QNED%20TVs%20come%20with%20Quantum,purer%20colours%20with%20more%20depth ("QNED TVs come with Quantum Dot and NanoCell technology, offering a premium picture display with accurate colour representation. Nanoparticles – which are integrated into the panel itself[.]").

168. The Accused Products "come with quantum dot" technology "integrated into the panel itself."[24] Quantum dots are nanoparticles.[25]

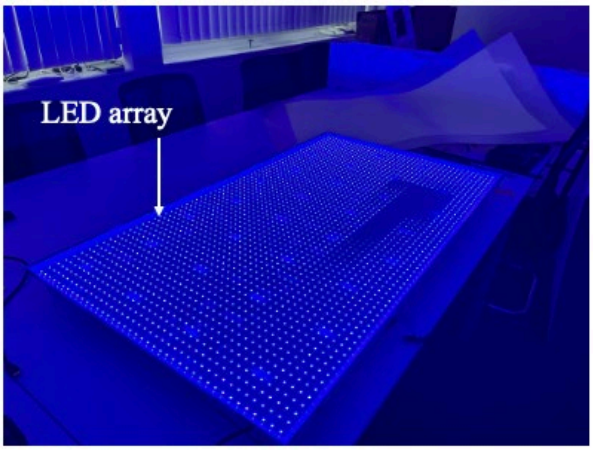
> QNED TVs come with Quantum Dot and NanoCell technology, offering a premium picture display with accurate colour representation. Nanoparticles – which are integrated into the panel itself – act as a filter to remove impurities in light wavelengths. This means that you'll be able to enjoy purer colours with more depth.

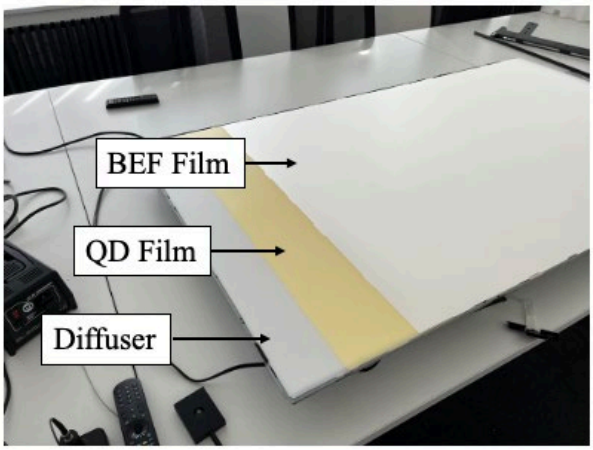
169. The Accused Products contain quantum dots comprised of a core comprising a core semiconductor material. The Accused Products contain quantum dots with In-P cores.

170. The LG 65QNED90 TV is representative of all Accused Products, and the infringing features present in the LG 65QNED90 TV product are common in all of the Accused Products.

171. For example, the LG 65QNED90 TV consists of a blue min-LED edge backlit system comprising, *inter alia*, a mini-LED array, diffuser plate, a quantum dot film, and a brightness enhancement optical film:[26,27]

[24] https://www.lg.com/my/lg-experience/helpful-hints/lg-screen-technology-explained/#:~:text=QNED%20TVs%20come%20with%20Quantum,purer%20colours%20with%20more%20depth ("QNED TVs come with Quantum Dot and NanoCell technology, offering a premium picture display with accurate colour representation. Nanoparticles – which are integrated into the panel itself[.]").
[25] *Id.*
[26] https://www.amazon.com/dp/B0CVSJMZCT?ref_=ppx_hzsearch_conn_dt_b_fed_asin_title_1&th=1
[27] Teardown of LG 65QNED90 TV.





172. The quantum dots in the LG 65QNED90 TV are cadmium-free InP quantum dots that, on information and belief, contain a core semiconductor material comprising Indium (group 13) and Phosphorous (group 15).

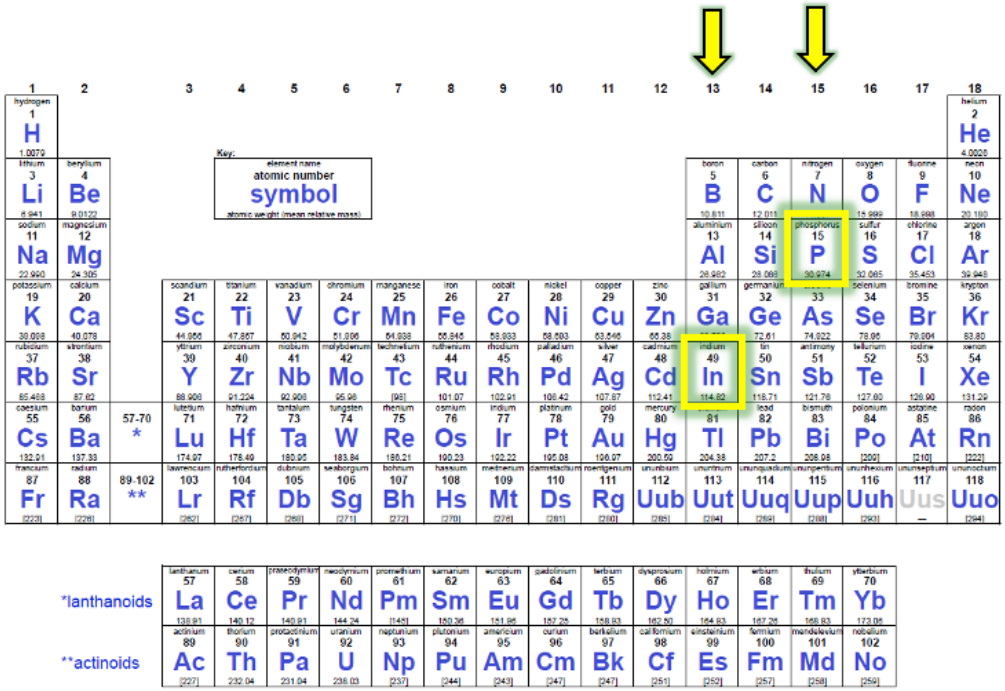
173. The Accused Products contain quantum dots the further comprise a first layer comprising a first semiconductor material provided on said core and a second layer comprising a second semiconductor material provided on said first layer, said core semiconductor material being different to said first semiconductor material and said first semiconductor material being different to said second semiconductor material. On information and belief, the quantum dots in the Accused

Products comprise first and second layers on said core, one layer comprising ZnSe and a second layer comprising ZnS.

174. The quantum dots in the LG 65QNED90 TV comprise Zinc (group 12), as well as Sulfur and Selenium (Group 16). The first layer in the LG 65QNED90 TV (ZnSe or ZnS) is different to said core semiconductor material (In-P). The second layer in the LG 65QNED90 TV is different to said first layer (ZnS is different from ZnSe).

175. The Accused Products contain quantum dots that are produced by effecting conversion of a nanoparticle core precursor composition to a material of the nanoparticle core.

176. The Accused Products contain quantum dots that are produced by providing a nanoparticle precursor composition comprising group 13 ions and group 15 ions. On information and belief, the Accused Products contain quantum dots that are made by providing a precursor composition comprising Indium (group 13) and Phosphorous (group 15):



177. The quantum dots in the LG 65QNED90 TV are cadmium-free InP quantum dots that, on information and belief, are made by providing a precursor composition comprising Indium (group 13) and Phosphorous (group 15).

178. These first and second precursors species contain first and second ions, respectively, to be incorporated into the nanoparticles. The Indium precursor species contains Indium ions; the Phosphorus precursor species contains Phosphorus ions. This precursor composition is converted into a nanoparticle core.

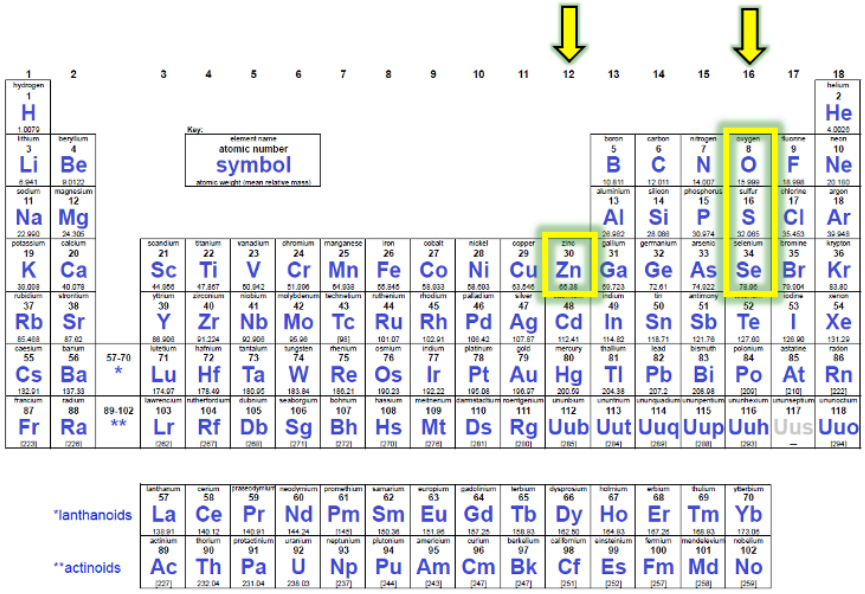
179. The Accused Products contain quantum dots that are made by converting the nanoparticle precursor into nanoparticles. For example, in the 65QNED90 TV, the precursor composition is converted into the core of the quantum dots in the Accused Products, specifically In-P cores.

180. The Accused Products contain quantum dots that are produced by depositing said first layer on said core. On information and belief, the quantum dots are produced by: adding a first layer of ZnSe on the In-P core; and said second layer comprising ZnS is deposited on said first layer. As discussed above, the quantum dots in the LG 65QNED90 TV comprise Zinc (group 12), as well as Sulfur and Selenium (Group 16). The first layer in the LG 65QNED90 TV (ZnSe or ZnS) is different to said core semiconductor material (In-P). The second layer in the LG 65QNED90 TV is different to said first layer (ZnS is different from ZnSe).

181. The precursor composition in the Accused Products' quantum dots comprise a first precursor species containing a first ion to be incorporated into the growing nanoparticle core and a separate second precursor species containing a second ion to be incorporated into the growing nanoparticle core. As described above, the first and second precursors species contain first and

second ions, respectively, to be incorporated into the nanoparticles. The Indium precursor species contains Indium ions; the Phosphorus precursor species contains Phosphorus ions.

182. The Accused Products contain quantum dots that are produced wherein said conversion is effected in the presence of a molecular cluster compound different from the nanoparticle core precursor composition. In synthesizing the quantum dots in the Accused Products, said conversion is effected in the presence of a molecular cluster compound incorporating group 12 ions and group 16 ions. On information and belief, a molecular cluster compound is formed during said conversion which incorporates Zinc (Group 12) and Oxygen, Selenium, and/or Sulfur (Group 16) ions:



183. O, S, and Se are ions from group 16 of the periodic table. Group 16 elements include: O, S, Se, Te, Po, and Uuh. Further, Zn is an ion from group 12 of the periodic table. Group 12 elements include: Zn, Cd, Hg, and Cn.

184. The quantum dots in the LG 65QNED90 TV are cadmium-free InP quantum dots that, on information and belief, are made from the conversion of the precursors comprising Indium (group 13) and Phosphorous (group 15) into quantum dots in the presence of a molecular cluster

compound incorporating group 12 ions and group 16 ions. The quantum dots in the LG 65QNED90 TV also comprise Zinc (group 12), and one or more of Sulfur, Selenium, and Oxygen (Group 16).

185. The group 12 and 16 molecular cluster compound is different from the first and second precursor species (Indium and Phosphorus). The conversion is effected under conditions permitting seeding and growth of nanoparticles. The synthesis used to make the quantum dots found in the Accused Products uses the molecular cluster compound to aid the formation and growth of the quantum dot cores.

186. Accordingly, the Accused Products contain each and every element in claim 1 of the ’557 Patent.

187. LG has violated 35 U.S.C. § 271(g) by unlawfully importing into the United States or offering to sell, selling, or using within the United States, at least, the Accused Products incorporating quantum dots made by a process that infringes at least independent claim 1 of the ’557 patent.

188. LG indirectly infringes the ’557 Patent because it has induced third parties, including customers, subsidiaries and wholly- or partially-owned companies, end users, distributors, and/or retailers, to have made, use, offer for sale, sell, and/or import the Accused Products without Nanoco’s permission in violation of 35 U.S.C. § 271(b).

189. Based on information and belief, third parties, including customers, subsidiaries and wholly- or partially-owned companies, end users, distributors, and/or retailers, have directly infringed the ’557 Patent by having made, using, offering for sale, selling, and/or importing the Accused Products, including, for example, by manufacturing, configuring, using, selling, and operating the Accused Products.

190. LG induced these third parties' direct infringement by advertising, encouraging, instructing, providing support for, and/or operating the Accused Products for or on behalf of such third parties. For example, on information and belief, LGE induces LGEUS to import, market, offer to sell, and sell the Accused Products within the United States. Also, LG publishes specifications, datasheets, instruction manuals, support materials, developer materials, marketing materials, and user guide materials that explain, advertise, instruct on, or provide support for the Accused Products.

191. LG took the above actions intending to cause infringing acts by these third parties.

192. If LG did not know that the actions it encouraged constituted infringement of the '557 Patent, LG was willfully blind as to its inducing infringement of others. LG subjectively believed that there was a high probability that others would infringe the '557 Patent but took deliberate steps to avoid confirming that it was actively inducing infringement by others.

193. LG has also been on notice of '557 Patent since at least October 11, 2023, when Nanoco identified the '557 Patent to LG in written communication responsive to LG's announcement and release of QNED products.

194. Additionally, LG has been on notice of the '557 Patent no later than the filing and service of this Complaint.

195. Nanoco has sustained damages owing to LG's infringement of the '557 Patent.

196. LG had knowledge of the '557 Patent and knew its actions constituted infringement of the '557 Patent, or at least subjectively believed that there was a high probability that the '557 Patent existed and took deliberate actions to avoid learning of the '557 Patent.

197. LG's infringement of the '557 Patent is exceptional and Nanoco is entitled to recover reasonable attorneys' fees incurred in prosecuting this action in accordance with 35 U.S.C. § 285.

JURY DEMAND

Plaintiff hereby demands a trial by jury on all issues so triable.

PRAYER FOR RELIEF

WHEREFORE Plaintiff Nanoco asks this Court for an order granting the following relief:

a. a judgment in favor of Plaintiff that Defendants have infringed, either literally and/or under the doctrine of equivalents, the Asserted Patents;

b. all equitable relief the Court deems just and proper as a result of Defendants' infringement, including an injunction;

c. a judgment and order finding that Defendants' infringement has been willful;

d. a judgment and order requiring Defendants to pay Plaintiff its damages, costs, expenses, and any enhanced damages to which Plaintiff is entitled for Defendant's infringement;

e. a judgment and order requiring Defendants to provide an accounting;

f. a judgment and order requiring Defendants to pay supplemental damages to Plaintiff, including without limitation, pre-judgment and post-judgment interest;

g. a judgment and order requiring Defendants to pay on-going royalties to the extent not enjoined;

h. a judgment and order finding that this is an exceptional case within the meaning of 35 U.S.C. § 285 and awarding Plaintiff its reasonable attorneys' fees against Defendant; and

i. any and all other relief as the Court may deem appropriate and just under the circumstances.

DATED: April 24, 2025

Respectfully submitted,

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